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CRM 89-137 / August 1989

RESEARCH MEMORANDUM

PERSONNEL PROJECTIONS FOR THE ELECTRONIC WARFARE TECHNICIAN RATING

David Rodney

A Division of CNA *Hudson Institute*

CENTER FOR NAVAL ANALYSES

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Work conducted under contract N00014-87-C-0001.

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for Public Release; Distribution Unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) CRM 89-137	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Center for Naval Analyses 6b. OFFICE SYMBOL (*If applicable*) CNA	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (*City, State, and ZIP Code*) 4401 Ford Avenue Alexandria, Virginia 22302-0268	7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING ORGANIZATION Office of Naval Research 8b. OFFICE SYMBOL (*If applicable*) ONR	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-87-C-0001
8c. ADDRESS (*City, State, and ZIP Code*) 800 North Quincy Street Arlington, Virginia 22217	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. 65154N; PROJECT NO. R0148; TASK NO.; WORK UNIT ACCESSION NO.
11. TITLE (*Include Security Classification*) Personnel Projections for the Electronic Warfare Technician Rating	
12. PERSONAL AUTHOR(S) David Rodney	
13a. TYPE OF REPORT Final 13b. TIME COVERED FROM TO	14. DATE OF REPORT (*Year, Month, Day*) August 1989 15. PAGE COUNT 51
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	Billets (personnel), Compensation, Computerized simulation, Grade structure (personnel management), Inventory, Manpower, Naval personnel, Personnel retention, Policies, Promotion, Ratings, Sea/shore rotation, Tables (data)
05	09		

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

This research memorandum provides personnel projections for the Electronic Warfare Technician rating. The projections are obtained from a simulation model and show how the future of the rating will vary with the mix of four- and six-year obligors. The analysis focuses on projected sea and shore manning, accessions, promotion opportunity, longevity, and individuals account.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED / UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (*Include Area Code*) / 22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR

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15 August 1989

MEMORANDUM FOR DISTRIBUTION LIST

Subj: Center for Naval Analyses Research Memorandum 89-137

Encl: (1) CNA Research Memorandum 89-137, *Personnel Projections for the Electronic Warfare Technician Rating*, by David Rodney, Aug 1989

1. Enclosure (1) is forwarded as a matter of possible interest.

2. This research memorandum provides personnel projections for the Electronic Warfare Technician rating. The projections are obtained from a simulation model and show how the future of the rating will vary with the mix of four- and six-year obligors. The analysis focuses on projected sea and shore manning, accessions, promotion opportunity, longevity, and individuals account.

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CRM 89-137 / August 1989

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ABSTRACT

This research memorandum provides personnel projections for the Electronic Warfare Technician rating. The projections are obtained from a simulation model and show how the future of the rating will vary with the mix of four- and six-year obligors. The analysis focuses on projected sea and shore manning, accessions, promotion opportunity, longevity, and individuals account.

EXECUTIVE SUMMARY

BACKGROUND

The derivation of consistency between billet structure and personnel policies, leading to an executable force structure, is a complex issue. A simulation model is under development at CNA to facilitate the study of consistency between billet structure and personnel policies. The model ages an inventory and simulates the effect over time of policy decisions regarding sea/shore rotation, promotion, and compensation. An initial version of the model that models the effects of both sea/shore rotation and promotion policies has been completed: compensation effects need to be added. The completed version of the model has been used to investigate the structure of the Electronic Warfare Technician (EW) rating, and the results of the analysis are reported in this research memorandum.

OBJECTIVE

The EW rating has undergone much change in the past few years, and current inventories do not match authorizations. In particular, the requirement for EWs has grown during the 1980s, and the Navy has increased the number of accessions into the rating. The current outcome of these efforts is a surplus of junior personnel and a shortage of senior personnel. In addition, the EW rating is a mix of six-year obligors (6YOs) and four-year obligors (4YOs). The mix has been varied in recent years and is the subject of some debate. The simulation model was used to forecast the future of the EW rating and observe the effects of varying the mix of 4YOs and 6YOs. The results of the simulation are summarized below.

FINDINGS AND CONCLUSIONS

Currently, the EW rating is undermanned in the E-6 and E-7 pay grades. But this undermanning should disappear in the next couple of years, and full manning of billets in senior pay grades should be achievable for the indefinite future.

The automatic advancement of 6YO EWs to E-4 when they complete A-school causes problems in attaining authorized manning levels for the E-3 and E-4 pay grades. The current mix of 6YOs and 4YOs (i.e., 85 percent 6YOs and 15 percent 4YOs) is not consistent with authorizations. Overmanning of E-4 billets and undermanning of E-3 billets are inevitable, given the high concentration of 6YOs in the rating and their automatic advancement. If the mix of 6YOs and 4YOs is changed to 50 percent each, the EW rating would be able to attain authorized manning levels for both E-3 and E-4 billets.

An opposite difficulty would occur if the EW rating were to transition into an entirely 4YO rating. In this situation there would be a surplus of E-3s and a shortage of E-4s. This manning imbalance could be alleviated by reducing time-in-service requirements for promotion to E-4 from 24 months to approximately 18 months.

The EW rating will grow in average longevity for the next ten years. This is due to the fact that the rating has undergone significant growth in the last few years, and recent large accession cohorts are gradually aging. Currently, the average longevity of a member of the EW rating is approximately 6.1 years of service. Ten years from now, average longevity is projected to be approximately 7.5 years of service.

The size of the required training pipeline may drop from the current level of approximately 640 personnel per year to approximately 450 per year. The reduction is due to the fact that the EW rating is no longer growing, but is merely maintaining current authorization levels. In any individual year, accession requirements may vary from 450 if the sole objective of setting accession targets is to obtain desired strength by the end of the fiscal year. However, if any year's accessions are substantially varied from the steady-state value of 450, then accession requirements in subsequent years will fluctuate sharply, causing great strain to the training establishment.

The EW rating should be able to maintain 100-percent sea manning for the indefinite future, though there will be significant variations in total sea manning from one year to the next and substantial fluctuations in sea manning within individual pay grades. Sea manning levels in individual pay grades are sensitive to changes in the mix of 4YOs and 6YOs. In particular, if the EW rating maintains its current mix, E-5 sea manning should rapidly decline to authorized levels and maintain that level after a brief dip below authorizations. Also, given the current mix of 6YOs and 4YOs, E-6 and E-7 sea manning levels are projected to surge significantly above authorized levels in the 1994 to 1995 time frame. At other times during the next ten years, E-6 and E-7 sea manning should be near authorizations.

If the share of 4YOs in the EW rating is increased, there would be significant changes to E-5 and E-6 sea manning. In brief, an increase in the number of 4YOs would cause a decline in E-5 sea manning and an increase in E-6 sea manning. This is because a typical 4YO serves an initial shore tour as an E-5 and returns to sea as an E-6, whereas a typical 6YO serves at least part of the initial shore tour as an E-6.

The outlook for promotion opportunities in the EW rating is fine. There should be a surge in promotions in the near future in order to attain full strength in the E-6 and E-7 grades. Subsequently, promotion opportunities should settle into a stable pattern, with a reasonable number of promotions each year. The only problem area remains the promotion opportunity for 4YOs from E-3 to E-4.

Finally, the individuals account in the EW rating should decline in size during the next couple of years due to the anticipated drop in accessions. In the event that the share of 4YOs increases, a further substantial decline in the individuals account is to be expected.

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INTRODUCTION

The concept of an "optimum force" is the embodiment of the search for an efficient force structure. Issues such as desirable pay grade and length of service distributions and necessary accession and retention rates are involved in the development of an optimum force. To devise a truly optimal way to man the Navy, it would be necessary to relate personnel resources to readiness in a precise manner. Currently, such a capability does not exist. However, it is possible and fruitful to investigate the internal consistency of billet structure and Navy policies to ensure one is operating in an efficient and sensible manner. The derivation of consistency between billet structure and personnel policies, leading to an executable force structure, is a complex issue, and requires significant effort.

A simulation model is under development at the Center for Naval Analyses (CNA) to facilitate the study of consistency between billet structure and personnel policies. The model ages an inventory in both the short- and long-term, and focuses on three policy areas: sea/shore rotation, promotion, and compensation. The model simulates the effect of policy decisions over time and demonstrates the interactions of policies. An initial version of the model has been completed. This interim model simulates the effects of both sea/shore rotation and promotion policy on inventories; compensation effects still need to be added. The model has been designed to simulate the dynamics of individual communities (typically, a rating).

The completed version of the model has been used to investigate the structure of the Electronic Warfare Technician (EW) rating. This rating has undergone much change in the past few years, and current inventories do not match authorizations. It is not immediately apparent whether the EW rating will "fall into line" in the next few years, or whether there are systemic problems in rating billet structure and policies that inhibit the matching of personnel levels to authorizations. This research memorandum describes the results of a variety of simulations of the EW community, which throw some light on the likely future for the rating.

BACKGROUND

The requirements for EWs have increased during the 1980s due to the building of additional ships. Many of the increases in requirements have occurred at midlevel and senior petty officer grades. It takes several years to "grow" new accessions into experienced personnel. Consequently, the Navy has increased the number of accessions into the EW rating in order to obtain these experienced personnel. The current outcome of these efforts is a surplus of junior personnel and a shortage of senior personnel. Table 1 exhibits fiscal year 1989 authorizations for the EW rating, and table 2 describes the inventory during the early part of fiscal year 1989.

Table 1. EW authorizations

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
Sea billets	273	514	369	371	241	25	7	1,800
Shore billets	5	59	169	283	168	42	23	749
Individuals account	142	160	60	49	15	2	0	428
Total	420	733	598	703	424	69	30	2,977

Table 2. EW inventory

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
Sea billets	199	732	591	202	221	19	8	1,972
Shore billets	6	40	100	305	116	43	20	630
Individuals account	38	321	129	37	24	3	1	553
Total	243	1,093	820	544	361	65	29	3,155

The above tables exhibit the distribution of personnel and billets between sea activities, shore activities, and the individuals account. There is a need to consider force structure in this fashion because one of the largest problem areas in personnel management is the difficulty in obtaining a correct balance between sea and shore manning for individual pay grades. For example, Tables 1 and 2 show that total EW sea manning is 1,972 against an authorization of 1,800 sea billets, but E-6 sea manning is only 202 against an authorization of 371.

The EW rating is formed of a mix of six-year obligors (6YOs) and four-year obligors (4YOs). The mix of 6YOs and 4YOs has been varied in recent years and is the subject of some debate. A 4YO EW may serve what could be termed a classical career pattern. Such an individual joins the Navy and, after approximately six months of training, including EW A-school, goes to sea for the remainder of the four-year obligation. During this initial tour of sea duty, the individual would function as an operator of electronic warfare equipment. Upon reenlisting, the individual would have a tour of shore duty. Then, prior to returning to sea, the individual would attend C-school in order to become a maintainer of electronic warfare equipment and would fulfill such a role during the second sea tour. Subsequently, the individual would return to sea in a supervisory role. The Navy felt the need to obtain electronic warfare equipment maintainers prior to the second sea tour. Consequently, a 6YO program was put into place. This program has a two key features: automatic advancement to E-4 for 6YO personnel upon

completion of A-school, and a "training continuum" for 6YOs. The "training continuum" provides the following training schedule. 6YOs take the same A-school as 4YOs and also go to sea as operators upon completion of A-school. However, upon completion of an 18-month sea tour, a 6YO comes ashore and attends an eight-month C-school to be trained to become an electronic warfare equipment maintainer. Then, the 6YO returns to sea for an additional 30 months, before entering a normal sea/shore rotation cycle.

The effects of the mixing of 4YOs and 6YOs as well as the implementation of the training continuum are difficult to unravel. However, notable adverse effects include increased turnover of junior personnel at sea and limited promotion opportunity for 4YOs (the 6YOs are filling all the vacancies at E-4 due to their automatic advancement). The author is unable to judge the benefits of having personnel trained to be maintainers at an earlier point in their careers. Currently, approximately 85 percent of the EW training pipeline is for 6YOs and 15 percent is for 4YOs.

This rather confusing situation raises concerns regarding the mix of 4YOs and 6YOs in the EW rating. To facilitate an analysis of the situation, a number of simulations of the EW community were carried out with the aforementioned software. The results of those simulations are described below.

SIMULATIONS

The future of the EW rating was projected under a number of assumptions regarding policies that will be applied to the rating. It was assumed that all current policies regarding promotion and sea/shore rotation will be maintained, namely: (1) personnel will be promoted to fill vacancies with the exception of automatic advancement of 6YOs to E-4, (2) time-in-grade and time-in-service requirements for promotion will be unchanged, (3) high-year tenure requirements will not change, and (4) sea/shore rotation will follow the guidelines of the Enlisted Transfer Manual,[1] with the exception that personnel will have initial tour patterns as described above for both the 4YO and 6YO programs.

The implications of the mixing of 4YOs and 6YOs within a rating were studied by carrying out a number of simulations wherein the mix was altered. In particular, four scenarios were considered: the current structure (i.e., 85 percent 6YOs and 15 percent 4YOs); 100-percent 6YOs; 50-percent 6YOs and 50-percent 4YOs; and 100-percent 4YOs. In all four scenarios it was assumed that existing personnel would continue in their current status, but new accessions would be divided according to the scenario under consideration.

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1. See, NAVPERS 15909D, *Enlisted Transfer Manual*, 1 Sep 1988

The model uses recent continuation rates to extrapolate current inventories into the future. A possible weakness in the simulation results is the reliability of these rates under different circumstances. In particular, as the mix of 4YOs and 6YOs varies, it is legitimate to doubt whether continuation rates would be unchanged. The simulation takes such effects into account inasmuch as rates are defined for individual pay-grade and length-of-service cells. This may be better understood by noting that 6YOs and 4YOs have differing pay-grade distributions during their early years of service, with 6YOs occupying more senior grades. The pay grade typically occupied by 4YOs at their initial reenlistment decision point (E-4) exhibits much lower continuation than the more senior pay grade occupied by 6YOs at the four-year point (E-5). Conversely, E-5s and E-6s exhibit lower continuation behavior than E-4s at the six-year point, corresponding to the behavior of 6YOs and 4YOs at this longevity point. No doubt, these numbers are not completely accurate, and the next version of the model, which will consider the effects of compensation changes on continuation behavior, will be more accurate. However, the results as described below do not appear to be particularly sensitive to moderate changes in continuation behavior. Consequently, the simulations do shed light on the likely evolution of the EW rating, though one should apply the usual caution and look for broad trends rather than precise results.

The EW rating was projected ten years into the future under each of the above four scenarios regarding the mix of 4YOs and 6YOs. In addition, the scenarios with the current mix and a 100-percent 4YO mix were further projected to 20 years into the future. The next section of this research memorandum described the results of these simulations from various perspectives.

SIMULATION RESULTS

Accessions

Accessions are the first topic to be discussed. This is because any discussions concerning future manning require knowledge of the number of personnel joining the EW community as time passes by.

Currently, the training pipeline for the EW community is approximately 640 students, comprising 90 4YOs and 550 6YOs. One might expect this number to drop in the coming years, since the EW community has stopped growing and is now merely attempting to be self-sustaining. The simulation estimates the number of losses to the community and computes the number of accessions required to bring the community to a fiscal-year end strength equal to authorizations.

This is a natural way to compute required accessions and is very much how the Navy, as a whole, operates. However, there are problems with such an approach. For example, a rating that is currently overmanned, such as EWs, requires only a small number of accessions to attain total authorized end strength. But this small cohort will result

in the need for a large accession cohort in the future. which in turn will give rise to the need for a small accession cohort, etc. If one wishes to avoid such oscillations in accession requirements, it is necessary to stabilize the number of personnel brought into the community from one year to the next.

Three simulations were carried out that illustrate this point. All of the simulations were based on the current rating structure of the EW community and only differed in the manner by which accessions were computed. The simulations were constrained to keep annual accessions from falling below specified levels. The levels were 373 (one-eighth of total EW authorizations), 400, and 425. The resulting annual accession requirements under each constraint are displayed in figure 1.

Figure 1 shows that approximately 450 accessions are required annually in order to maintain the desired EW end strength. This number, as was anticipated above, is smaller than the current EW training pipeline size. In addition, if accessions vary substantially from that number in any given year, then one can anticipate the accession needs will oscillate in subsequent years. Such oscillations place great stress on personnel management in general and on the training establishment in particular, and they should be avoided.

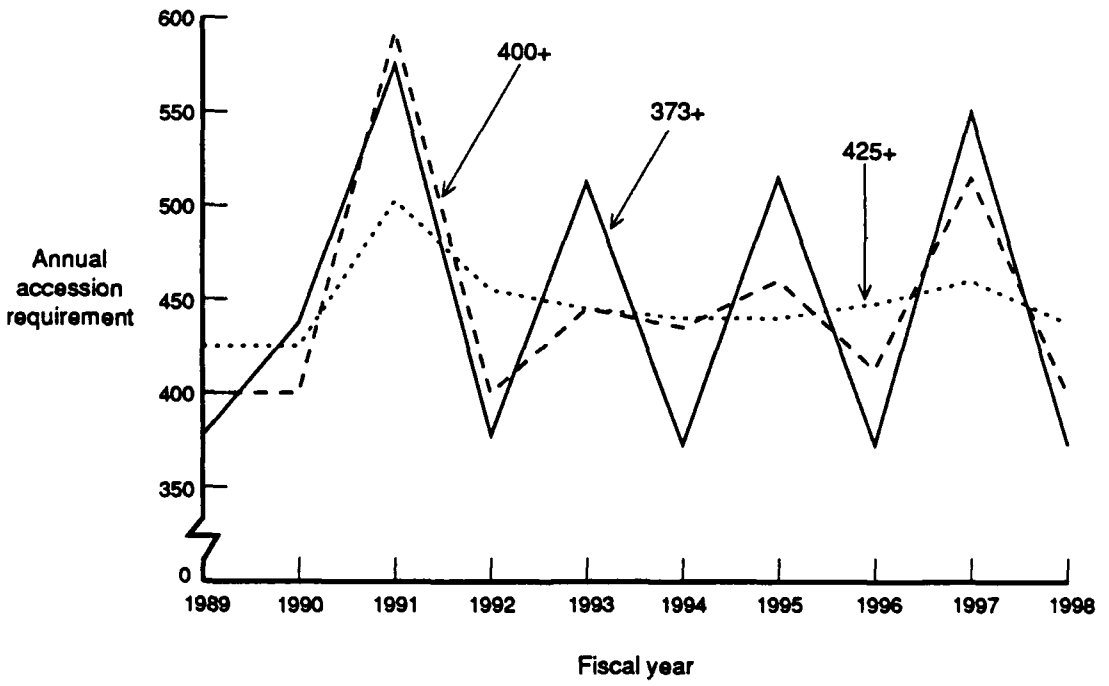

Figure 1. EW accession requirements, based on different minimum accession levels

For the remainder of the analysis, all simulations were based on the assumption that annual accessions will never drop below 425.

Manning

The undermanning in senior pay grades should disappear shortly, as personnel are promoted. Currently, there is an excess of personnel in junior pay grades. Large numbers of these personnel are eligible for promotion, so the pay-grade imbalances can be corrected. The simulations, by promoting personnel to fill vacancies, show that this will happen and that manning will reach full strength in pay grades E-6 and above in the next year or two. Similarly, the excess of E-5 personnel will decline to authorized levels over the next two years as promotions into the E-5 pay grade do not keep up with the number of personnel leaving the pay grade (either as promotions to E-6 or as losses to the Navy). Once desired pay-grade levels are attained, the simulations show that the rating will be able to maintain these levels from one year to the next.

The situation for E-4 and E-3 manning is more complex. The automatic advancement of 6YO personnel to E-4 upon completion of A-school means that there is no set limit on the number of E-4 personnel in the EW community. Moreover, since the total number of EW personnel is constrained to authorizations, a surfeit of E-4s will result in a shortage of E-3s. Table 3 exhibits projected manning levels in pay grades E-3 and E-4 under each of the scenarios regarding the mix of 4YOs and 6YOs.

Table 3 shows that there will be a consistent shortage of E-3s and a corresponding excess of E-4s in the current rating structure (85 percent 6YO) for the indefinite future. Indeed, a 100-percent 6YO EW rating would see E-3s vanishing as all personnel would make E-4 upon completing A-school. Evidently, there is an inconsistency between the current billet structure and a strong concentration of automatically advanced 6YOs. An EW rating that comprises 50-percent 6YOs and 50-percent 4YOs readily maintains authorized levels of E-3s and E-4s.

A different situation occurs when one considers the likely future for an EW rating comprising solely 4YOs. Here, one observes an excess of E-3s and a shortage of E-4s. This is caused by the following combination of events. Total EW authorizations constrain annual accessions (whence the number of E-3 personnel); time-in-grade requirements for promotion from E-3 to E-4 limit the number of personnel eligible for promotion to E-4; and continuation behavior in the senior pay grades determines vacancies for promotions from E-4 to E-5, causing the "loss" through promotion of E-4 personnel to more senior grades. The net effect is that the flows in and out of the E-4 pay grade are such that a 100-percent 4YO EW community could not maintain authorized levels of E-4 personnel. This situation could be alleviated by shortening the time required for promotion to E-4 from 24 months of service to approximately 18 months of service.

Table 3. Projected E-3 and E-4 manning

	85-percent 6YO		100-percent 4YO		50-percent 6YO		100-percent 6YO	
	E-3	E-4	E-3	E-4	E-3	E-4	E-3	E-4
Now (1989)	243	1,093	243	1,093	243	1,093	243	1,093
1990	346	973	585	734	451	868	301	1,018
1991	293	926	522	688	479	734	198	1,024
1992	242	956	546	663	468	734	103	1,095
1993	204	969	584	596	448	734	35	1,137
1994	197	976	585	596	442	734	16	1,166
1995	183	991	565	615	459	734	0	1,194
1996	180	993	547	633	437	733	0	1,204
1997	179	994	543	636	445	733	0	1,210
1998	179	994	565	615	444	734	0	1,208
1999	180	994	555	625	445	734	0	1,206
2004	188	995	595	591				
2009	191	1,022	574	614				
Authorizations	420	735	420	735	420	735	420	735

Longevity

The Electronic Warfare Technician rating is rather "young" due to its recent buildup. Thus, it is to be expected that longevity of personnel in the rating will grow over the next several years. The simulations confirm this expectation. All the scenarios indicate a gradual rise in longevity over the next several years, with notable growth occurring in the E-6 and E-7 pay grades. Again, this is to be expected, since the E-6 and E-7 pay grades are building up to authorized strength and will have a disproportionate number of personnel with junior longevity for the near future. Details regarding projected longevity are displayed in tables 4 through 7, where average longevity by pay grade for each projection year is shown for the various scenarios.

Those tables show an immediate prospective drop in longevity in most pay grades. This is due to the large number of personnel who are projected to be promoted in order to redress undermanning in the senior pay grades. These promotions will have a short-term effect of reducing average longevity in most pay grades.

Table 4. Projected longevity for current EW structure (85-percent 6YO) (years of service)

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	All EW
Now (1989)	2.6	2.2	5.0	9.2	14.6	20.0	23.7	6.1
1990	2.2	2.4	4.3	8.5	14.1	19.5	24.0	6.3
1991	2.5	2.4	4.3	8.9	14.3	19.2	24.2	6.5
1992	2.6	2.4	4.5	9.2	14.5	18.9	24.3	6.7
1993	2.5	2.4	4.6	9.4	14.7	18.7	24.1	6.8
1994	2.5	2.4	4.6	9.8	15.0	18.5	23.5	6.9
1995	2.4	2.5	4.7	10.1	15.3	18.6	23.2	7.1
1996	2.4	2.5	4.7	10.4	15.6	18.7	22.9	7.2
1997	2.4	2.5	4.8	10.6	15.9	18.9	22.8	7.3
1998	2.2	2.5	4.8	10.8	16.1	19.1	23.0	7.4
1999	2.4	2.5	4.8	10.9	16.3	19.3	23.1	7.4
2004	2.2	2.4	4.5	10.5	16.5	20.1	23.9	7.3
2009	2.3	2.4	4.5	10.0	16.1	19.9	24.4	7.1

Table 5. Projected longevity for 100-percent 4YO EW rating (years of service)

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	All EW
Now (1989)	2.6	2.2	5.0	9.2	14.6	20.0	23.7	6.1
1990	1.6	2.9	4.3	8.5	14.1	19.5	24.0	6.3
1991	1.2	3.4	4.4	8.9	14.3	19.2	24.2	6.5
1992	1.1	3.5	4.8	9.2	14.5	18.9	24.3	6.7
1993	1.2	3.5	5.1	9.4	14.7	18.7	24.1	6.9
1994	1.2	3.3	5.3	9.8	15.0	18.5	23.5	7.0
1995	1.2	3.3	5.3	10.2	15.3	18.6	23.2	7.2
1996	1.2	3.3	5.4	10.7	15.6	18.7	22.9	7.4
1997	1.1	3.4	5.4	11.0	15.9	18.9	22.8	7.5
1998	1.2	3.4	5.5	11.3	16.1	19.1	23.0	7.6
1999	1.1	3.4	5.5	11.5	16.3	19.3	23.1	7.7
2004	1.2	3.3	5.2	11.4	16.8	20.0	23.9	7.6
2009	1.1	3.2	5.1	10.9	16.5	20.1	24.4	7.4

Table 6. Projected longevity for 50-percent 6YO and 50-percent 4YO EW rating (years of service)

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	All EW
Now (1989)	2.6	2.2	5.0	9.2	14.6	20.0	23.7	6.1
1990	1.9	2.6	4.3	8.5	14.1	19.5	24.0	6.3
1991	2.0	2.7	4.3	8.9	14.3	19.2	24.2	6.5
1992	1.8	2.8	4.6	9.2	14.5	18.9	24.3	6.7
1993	1.9	2.6	4.8	9.4	14.7	18.7	24.1	6.8
1994	1.8	2.6	4.8	9.8	15.0	18.5	23.5	7.0
1995	1.9	2.6	4.8	10.1	15.3	18.6	23.2	7.1
1996	1.8	2.7	4.9	10.5	15.6	18.7	22.9	7.2
1997	1.8	2.7	5.0	10.8	15.9	18.9	22.8	7.4
1998	1.8	2.6	4.9	11.0	16.1	19.1	23.0	7.4
1999	1.7	2.6	4.9	11.1	16.3	19.3	23.1	7.5

Table 7. Projected longevity for 100-percent 6YO EW rating (years of service)

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	All EW
Now (1989)	2.6	2.2	5.0	9.2	14.6	20.0	23.7	6.1
1990	2.5	2.3	4.3	8.5	14.1	19.5	24.0	6.3
1991	3.1	2.3	4.3	8.9	14.3	19.2	24.2	6.5
1992	4.0	2.4	4.5	9.2	14.5	18.9	24.3	6.7
1993	4.6	2.4	4.5	9.4	14.7	18.7	24.1	6.9
1994	5.5	2.5	4.6	9.8	15.0	18.5	23.5	7.0
1995	--	2.6	4.7	10.1	15.3	18.6	23.2	7.1
1996	--	2.6	4.8	10.4	15.6	18.7	22.9	7.3
1997	--	2.7	4.9	10.6	15.9	18.9	22.8	7.4
1998	--	2.7	4.9	10.8	16.1	19.1	23.0	7.5
1999	--	2.7	4.9	10.9	16.3	19.3	23.1	7.5

The most significant differences between tables 4 through 7 concern the average longevity of E-3s and E-4s. The various mixes of 6YOs and 4YOs result in differing numbers of personnel being automatically advanced to E-4, and that accounts for the variations between the tables. Table 7 shows average longevity of E-3s increasing for a number of years, followed by several years which no longevity is reported.

This is because table 7 addresses the scenario under which the EW rating becomes 100 percent 6YO. In this situation, no new accessions would become E-3s, and the only E-3s in the EW rating would be those personnel already in a 4YO program. Such 4YOs would take a few years to either be promoted to E-4 or leave the Navy. While this is happening, the number of E-3s would be shrinking, and their longevity would be growing.

Sea and Shore Manning

The heart of the simulation model is the capability to observe how personnel rotate between sea duty and shore duty over a period of time. This capability provides a new way to understand how the myriad of Navy personnel management policies affect the ability of the Navy to assign the right people to the right jobs. In order to address this topic, billets are divided into three categories: sea billets, shore billets, and the individuals account. Tables 8 through 10 exhibit the projections for each type of manning for each of the simulation scenarios.

Table 8. Projected sea manning

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	1,972	1,972	1,972	1,972
1990	2,091	2,091	2,091	2,091
1991	1,746	1,930	1,802	1,721
1992	1,846	2,032	1,930	1,807
1993	1,917	1,996	1,967	1,893
1994	2,146	2,182	2,167	2,169
1995	2,125	2,133	2,183	2,147
1996	1,990	2,043	2,003	2,015
1997	1,927	1,986	1,963	1,950
1998	1,906	1,965	1,920	1,928
1999	1,939	1,996	1,965	1,960
2004	1,959	2,032		
2009	2,002	2,013		
Authorizations	1,800	1,800	1,800	1,800

These tables exhibit a number of broad trends in EW manning. First, there does not seem to be a problem in assigning enough personnel to sea billets: total sea manning is projected to be greater than authorizations at nearly every point in time for each of the scenarios. That does not mean, however, that sea manning in particular pay grades is necessarily in good shape, as will be described below. Similarly, shore manning is projected to be above authorized levels for the majority of the time. The reason for the projected high level of sea and shore manning is a projected drop in the size of the individuals account. The buildup of the EW rating is nearing completion. Conse-

quently, training pipelines are projected to shrink in the near future, resulting in a drop in the size of the individuals account. A more detailed discussion of the individuals account and its projected variations in the simulation scenarios is given later in this research memorandum.

Table 9. Projected shore manning

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	630	630	630	630
1990	758	758	758	758
1991	910	913	910	910
1992	900	909	902	901
1993	763	860	794	752
1994	529	718	590	492
1995	581	725	623	551
1996	726	825	764	717
1997	780	869	816	778
1998	804	888	840	804
1999	775	859	810	774
2004	737	832		
2009	707	826		
Authorizations	749	749	749	749

Table 10. Projected individuals account

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	553	553	553	553
1990	292	292	292	292
1991	387	189	324	414
1992	253	62	170	290
1993	317	148	243	351
1994	321	104	242	344
1995	292	146	211	319
1996	280	136	227	296
1997	290	148	223	306
1998	287	152	241	300
1999	284	148	227	295
2004	300	144		
2009	288	162		
Authorizations	428	428	428	428

Tables 8 through 10 exhibit rather large fluctuations in manning from one year to the next. These fluctuations are caused by the recent large accession cohorts moving through their careers in an orderly fashion and rotating from sea to shore to sea at regular intervals. So, as sea manning goes up, there is a complementary drop in shore manning, and vice versa. Figure 2 displays this situation by showing projected manning at each type of duty for the current EW rating structure.

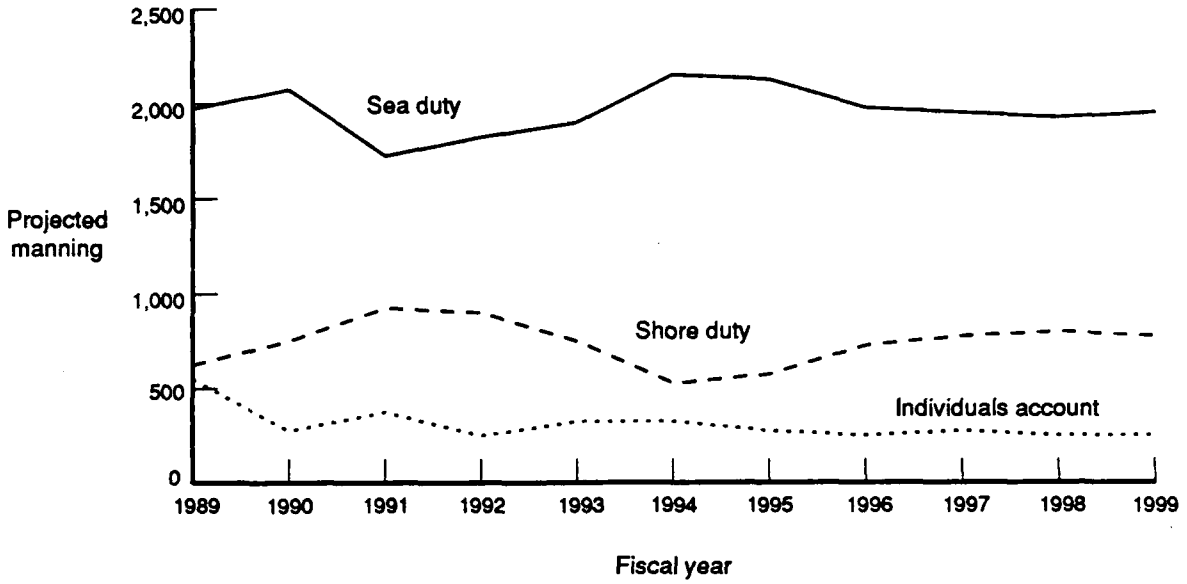

Figure 2. Projected manning for current EW rating structure

To fully appreciate what is happening to sea and shore manning, it is necessary to consider information at a pay-grade level of detail. This type of information is analyzed below, where attention is paid to the pay grades E-5 to E-7. The reasons for concentrating on these three pay grades are as follows. An analysis of all pay grades would be rather voluminous, and the bulk of data might obscure important trends. The sea and shore manning of E-5 to E-7 personnel is the key area of concern. In addition, the future patterns of sea and shore manning for E-3 and E-4 personnel are readily determined from the mix of 6YOs and 4YOs in the rating. Finally, the prospective manning of E-8 and E-9 billets does not appear to be a problem under any of the simulation scenarios.

As noted above, sea manning and shore manning are complementary. Thus, it suffices to consider prospective sea manning. Tables 11 through 13 display projected sea manning under each of the simulation scenarios for pay grades E-5 to E-7, respectively.

There are numerous observations one can make from these tables. First, there are projected patterns of manning that are invariant across the scenarios concerning 6YO and 4YO mix: E-5 sea manning is projected to drop to authorized levels in a couple of years; E-6 sea manning is projected to rapidly attain authorized levels and surge in five to six years time to levels substantially above authorizations; and E-7 sea manning is also projected to surge well beyond authorized levels in the 1994 to 1995 time-frame.

Table 11. Projected E-5 sea manning

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	591	591	591	591
1990	362	362	362	362
1991	306	348	325	296
1992	319	344	335	310
1993	355	301	339	362
1994	381	258	352	409
1995	382	230	354	408
1996	368	228	324	392
1997	356	225	312	379
1998	356	229	309	379
1999	363	232	321	385
2004	378	234		
2009	379	208		
Authorizations	369	369	369	369

Table 12. Projected E-6 sea manning

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	202	202	202	202
1990	377	377	377	377
1991	330	330	300	330
1992	346	346	346	346
1993	374	375	374	374
1994	491	490	491	493
1995	479	496	485	479
1996	412	468	435	405
1997	384	446	401	376
1998	379	441	391	376
1999	398	458	416	396
2004	383	450		
2009	372	450		
Authorizations	371	371	371	371

Table 13. Projected E-7 sea manning

	85-percent 6YO	100-percent 4YO	50-percent 6YO	100-percent 6YO
Now (1989)	221	221	221	221
1990	243	243	243	243
1991	226	226	226	226
1992	217	217	217	217
1993	214	214	214	214
1994	313	313	313	313
1995	288	288	288	288
1996	245	245	245	245
1997	229	229	229	228
1998	216	216	216	215
1999	222	221	221	222
2004	229	235		
2009	245	241		
Authorizations	241	241	241	241

The impact of different future mixes of 4YOs and 6YOs will take time to have an effect on the more senior pay grades. In the case of E-5s, differences in sea manning are projected within two years. But it takes six years before variations in accession cohorts have a noticeable effect on projected E-6 sea manning, and it takes more than ten years before any significant variations are projected in E-7 sea manning. An increased mix of 4YOs in the EW rating will cause a decrease in E-5 sea manning and an increase in E-6 sea manning, as may be seen in figures 3 and 4. The reason is that a typical 4YO EW serves an initial shore tour as an E-5 and returns to sea as an E-6. Figures 3 and 4 also highlight the projection that under the current rating structure, E-5 sea manning is likely to remain comparatively stable during the next several years, whereas E-6 sea manning is projected to have substantial variations.

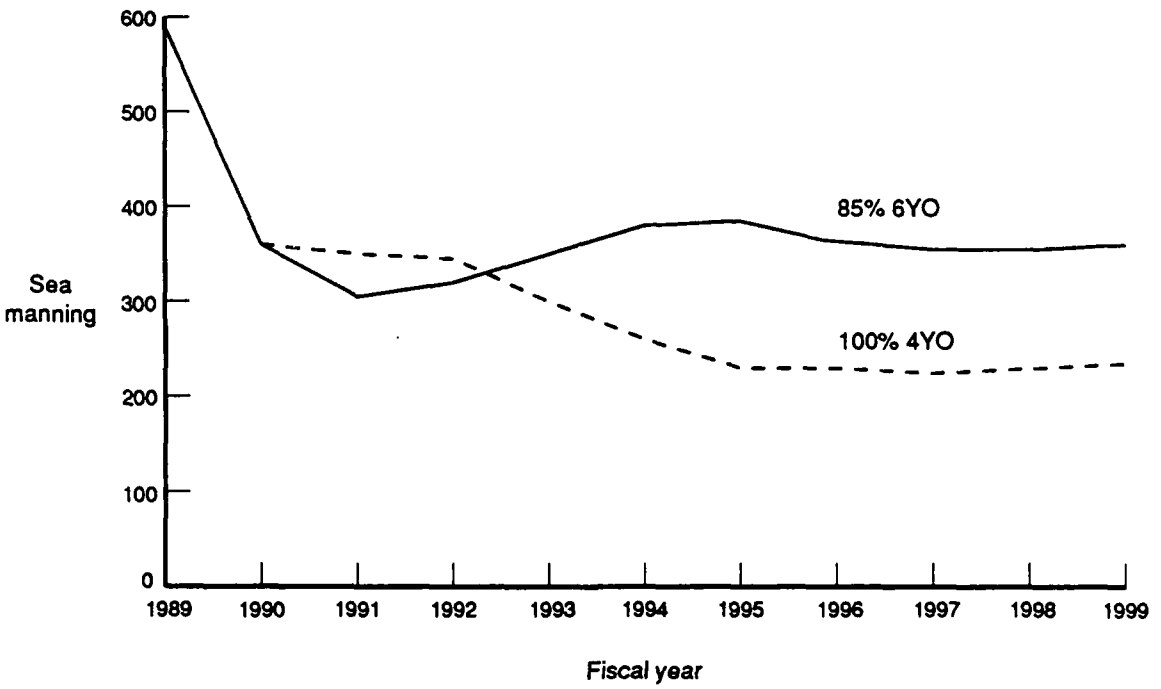

Figure 3. Projected E-5 sea manning

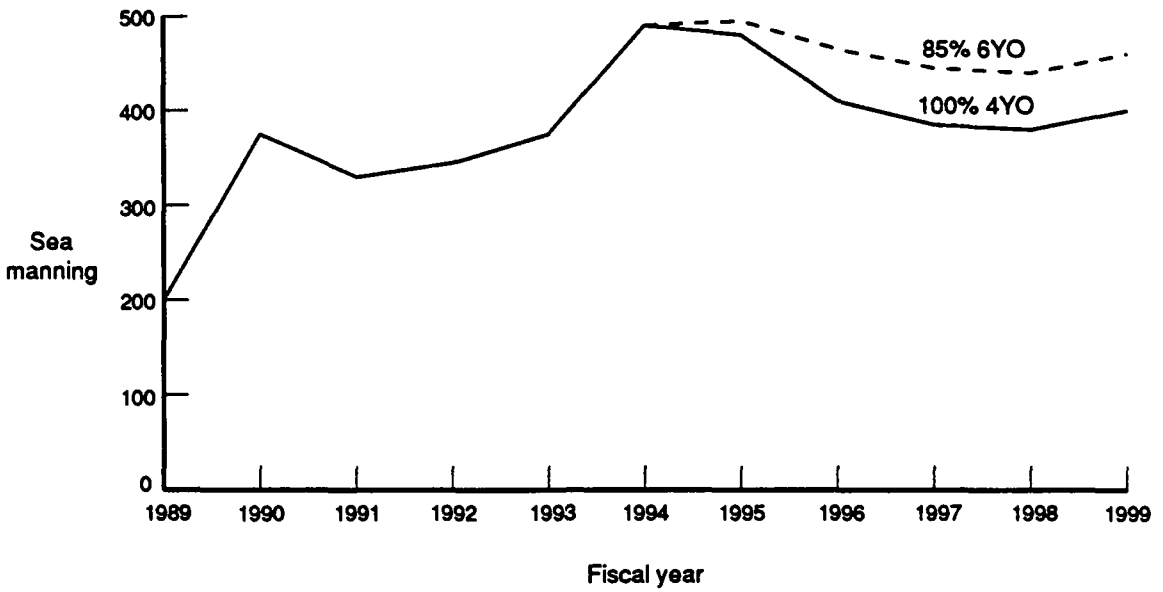

Figure 4. Projected E-6 sea manning

Individuals Account

Table 10 shows a projected decline in the individuals account for all scenarios regarding the mix of 4YOs and 6YOs. As noted above, this decline is due to the end of growth in the EW rating and a consequent reduction in the training pipeline. However, table 10 also exhibits marked differences in the individuals account between the various scenarios, with a larger mix of 4YOs corresponding to a smaller individuals account.

These differences are illustrated in figure 5, which compares the projected size of the individuals account for the current rating structure and a 100-percent 4YO EW rating. The differences in training between 4YO and 6YO EWs are the causes of the observed variations. In a substantially 6YO EW rating, a large number of personnel attend C-school after completing approximately two years of service. However, in a substantially 4YO EW rating, a smaller number of personnel attend C-school after completing approximately six years of service.

This situation may be better appreciated by considering the tables 14 and 15. Table 14 displays the projected pay grade distribution for personnel in the individuals account ten years from now, and table 15 shows analogous length-of-service distributions. Both tables highlight the fact that an increase in the mix of 4YOs in the EW rating would lead to a decline in the size of the individuals account but an increase in seniority of the personnel in the account. Tables 14 and 15, as is the case with all the simulation results, should not be taken as precise projections, but rather as an indication of trends and patterns.

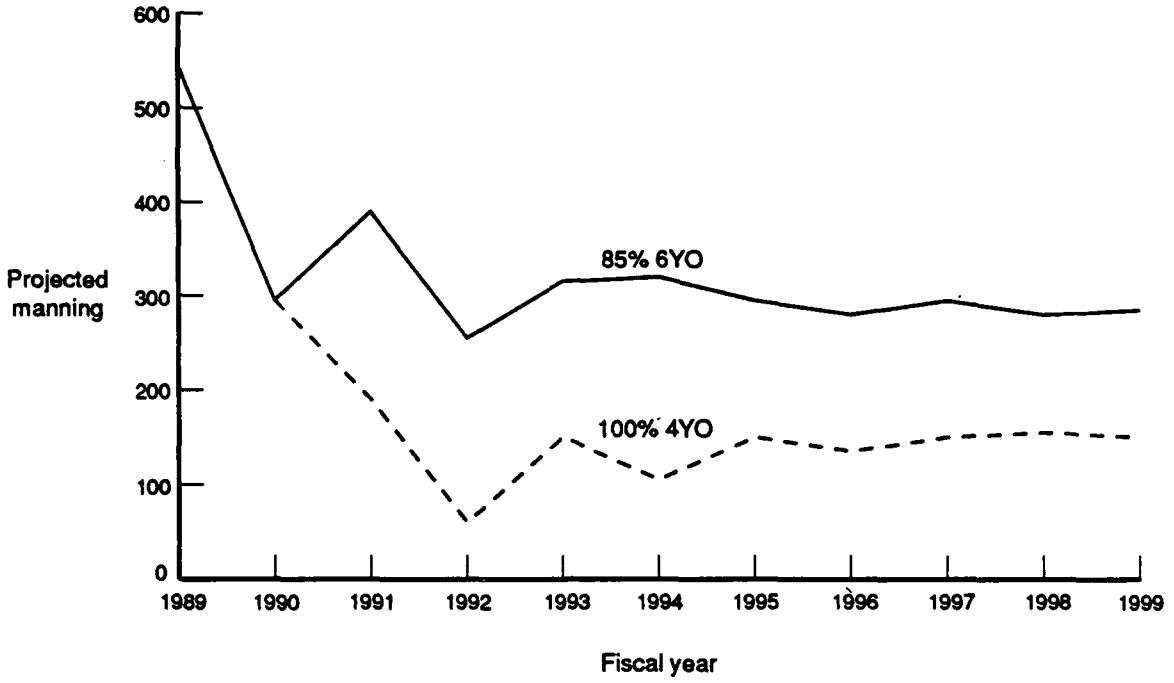

Figure 5. Projected manning of individuals account

Table 14. Projected pay-grade distribution of individuals account

	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
Now (1989)	38	321	129	37	24	3	1	553
1999--85-percent 6YO	29	137	76	30	9	1	1	283
1999--100-percent 4YO	0	24	74	40	9	1	1	149

Table 15. Projected longevity distribution of individuals account

	Now (1989)	1999-- 85-percent 6YO	1999-- 100-percent 4YO
LOS 1	71	0	0
LOS 2	30	0	0
LOS 3	235	206	4
LOS 4	81	2	2
LOS 5	41	7	24
LOS 6	14	17	0
LOS 7	16	20	95
LOS 8	7	10	0
LOS 9	7	0	1
LOS 10	11	1	1
LOS 11	11	0	1
LOS 12	1	5	6
LOS 13	2	0	0
LOS 14	6	4	4
LOS 15	1	0	0
LOS 16	3	3	3
LOS 17	3	2	2
LOS 18	4	1	1
LOS 19	1	1	1
LOS 20	2	1	1
LOS 21	1	1	1
LOS 22	2	1	1
LOS 23	2	0	0
LOS 24	0	0	0
LOS 25	0	0	0
LOS 26	0	0	0
LOS 27	0	0	0
LOS 28	0	0	0
LOS 29	1	0	0
LOS 30	0	0	0

From this persepctive, the above assertions regarding the individuals are reasonable and intuitively plausible. Further substantiation of the assertions for the likely future of the EW individuals account may be found by comparing the results to facts regarding analogous ratings. The size of the individuals account in the EW rating is large, even for a training-intensive rating: 553 personnel out of a rating strength of 3,155 is a large percentage (18 percent). The individuals account projection of 283 for the current rating structure would have just under 10 percent of the total in the individuals account. This percentage is comparable with that of other 6YO ratings, though maybe a little on the low side. A projection of 149 personnel in the individuals account for an entirely 4YO EW rating would result in 5 percent of the personnel in an individuals status. Such a percentage is analogous to other 4YO ratings, although it also may be a little low.

Promotions

Promotion opportunity is an important rating characteristic. The simulations computed numbers of promotions by years of service for each pay grade. Few variations were observed between the various simulation scenarios, apart from the obvious impact of the automatic advancement program on promotions to E-4. So, in order to be concise, the size of projected promotions is reported for only the current rating structure, while the projected average time to advancement is reported for both the current structure and a 100-percent 4YO structure. These data are displayed in tables 16 to 18. The timeframe for the data in the following tables appears to be one year different from previous tables. This is because the projections start from a point early in fiscal year 1989. Thus, initial projections of promotions are those that would occur during fiscal year 1989 and would lead to a projection of the inventory at an early point of fiscal year 1990.

Table 16. Projected promotions--current rating structure

	E-3 to E-4	E-4 to E-5	E-5 to E-6	E-6 to E-7	E-7 to E-8	E-8 to E-9
1989	256	245	338	121	23	7
1990	319	233	150	59	16	6
1991	345	193	113	56	18	7
1992	361	228	146	55	18	7
1993	338	211	133	55	19	8
1994	332	197	122	51	17	7
1995	330	197	119	50	17	8
1996	332	199	121	54	17	7
1997	339	208	126	59	17	7
1998	338	209	129	62	18	7
2003	356	224	148	75	19	7
2008	354	223	149	69	19	7

Table 17. Projected average time-in-service for advancement (YOS) (current rating structure)

	E-3 to E-4	E-4 to E-5	E-5 to E-6	E-6 to E-7	E-7 to E-8	E-8 to E-9
Now (1988)	1.1	4.3	6.9	11.5	17.2	20.7
1989	0.9	3.4	7.0	11.4	17.4	22.3
1990	1.1	3.6	6.5	11.4	17.1	21.8
1991	1.0	3.7	6.4	11.8	16.8	21.4
1992	1.1	3.7	6.3	11.4	16.7	21.0
1993	1.1	3.6	6.6	11.8	16.7	20.9
1994	1.1	3.6	6.8	12.2	16.9	20.7
1995	1.1	3.7	6.8	12.4	17.3	20.5
1996	1.0	3.7	6.8	12.7	17.5	20.5
1997	1.0	3.7	7.0	13.1	17.7	20.6
1998	1.1	3.7	7.0	13.3	17.9	20.8
2003	1.0	3.7	6.7	13.5	18.7	21.2
2008	1.1	3.7	6.5	12.8	18.4	22.3

Table 18. Projected average time-in-service for advancement (YOS) (100-percent 4YO rating)

	E-3 to E-4	E-4 to E-5	E-5 to E-6	E-6 to E-7	E-7 to E-8	E-8 to E-9
Now (1988)	1.1	4.3	6.9	11.5	17.2	20.7
1989	3.5	3.4	7.0	11.4	17.4	22.3
1990	2.8	3.8	6.5	11.4	17.1	21.8
1991	2.5	4.3	6.4	11.8	16.8	21.4
1992	2.5	4.4	6.3	11.4	16.7	21.0
1993	2.5	4.4	6.8	11.8	16.7	20.9
1994	2.5	4.3	7.5	12.2	16.9	20.7
1995	2.5	4.2	7.6	12.4	17.3	20.5
1996	2.5	4.3	7.7	12.8	17.5	20.5
1997	2.5	4.3	7.8	13.1	17.7	20.6
1998	2.5	4.3	7.8	13.5	17.9	20.8
2003	2.5	4.2	7.6	14.1	18.5	21.8
2008	2.5	4.2	7.2	13.5	18.6	22.2

Table 16 exhibits an immediate surge in promotions out of pay grades E-5 and E-6, as the EW rating attains authorized levels. The rest of the data in table 16 show a stable pattern of promotions, with a reasonable number of promotions out of each pay grade. (The data obscure the limited promotion opportunity of 4YOs, since table 16 reports the total of 4YO and 6YO promotions.) Tables 17 and 18 show that the average time to advancement should remain within acceptable limits under differing mixes of 4YOs and 6YOs. The tables indicate that it would take somewhat longer to be promoted to both E-6 and E-7 if the mix of 4YOs is increased. However, it would be some years before this effect would become apparent.

Sea Duty Career Patterns

It is worthwhile to describe the career patterns of EW personnel, their typical longevity and pay grades during sea tours, and how this varies with their enlistment program. Table 19 displays appropriate information.

Table 19. Longevity and seniority during sea tours

	6YO		4YO	
	Longevity	Grade	Longevity	Grade
1st sea tour	7 - 24 months	E-4	7 - 48 months	E-3/E-4
2nd sea tour	33 - 62 months	E-5	7 - 11 years	E-6
3rd sea tour	7.5 - 11.5 years	E-6	13 - 17 years	E-7
4th sea tour	14 - 18 years	E-7	21 - 24 years	E-7 - E-9
5th Sea Tour	22 - 25 years	E-7 - E-9		

It is interesting to observe that the second sea tour for a 4YO almost exactly corresponds to the third sea tour for a 6YO in both the point in a member's career in which it occurs and the pay grade of the member at that point in time. Similar comments apply to subsequent tours.

CONCLUSIONS

The simulations described above have shown the likely future of the EW rating and how the future would vary if the mix of 4YOs and 6YOs is altered. The variables examined include accession needs, manning levels for different duty types, promotion opportunities, changes in longevity, and the size of the individuals account. This information can aid Navy manpower and personnel managers in formulating policies that will facilitate efficient and effective management of the EW rating. The conclusions to be drawn from the simulations are highlighted below.

Currently, the EW rating is undermanned in the E-6 and E-7 pay grades. This undermanning should disappear in the next two years, and full manning of billets in senior pay grades should be achievable for the indefinite future.

The automatic advancement of 6YO EWs to E-4 when they complete A-school causes problems in attaining authorized manning levels for the E-3 and E-4 pay grades. The current mix of 6YOs and 4YOs is not consistent with authorizations. Overmanning of E-4 billets and undermanning of E-3 billets are inevitable, given the high concentration of 6YOs in the rating and their automatic advancement. If the mix of 6YOs and 4YOs is changed to 50 percent each, the EW rating would be able to attain authorized manning levels for both E-3 and E-4 billets.

An opposite difficulty would occur if the EW rating were to transition into an entirely 4YO rating. In this situation there would be a surplus of E-3 personnel and a shortage of E-4 personnel. This manning imbalance could be alleviated by reducing time-in-service requirements for promotion to E-4 from 24 months to approximately 18 months.

The EW rating will grow in average longevity for the next ten years. This is due to the fact that the rating has undergone significant growth in the last few years, and recent large accession cohorts are gradually aging. Currently, the average longevity of a member of the EW rating is approximately 6.1 years of service. Ten years from now average longevity is projected to be approximately 7.5 years of service.

The size of the required training pipeline may drop from the current level of approximately 640 personnel per year to approximately 450 per year. The reduction would be due to the fact that the EW rating is no longer growing, but is merely maintaining current authorization levels. In any individual year accession requirements may vary from 450 if the sole objective of setting accession targets is to obtain desired strength by the end of the fiscal year. However, if any year's accessions are substantially varied from the steady-state value of 450, then accession requirements in subsequent years will fluctuate sharply, causing great strain to the training establishment. It is clearly desirable to maintain a steady level of accessions into the EW rating from one year to the next, even at the expense of not precisely attaining authorized strength at fiscal year's end.

The EW rating should be able to maintain 100-percent sea manning, albert with significant fluctuations, for the indefinite future. However, there are numerous difficulties associated with attaining desired manning levels in individual pay grades. Sea manning levels for the E-3 and E-4 pay grades are confounded by the imbalances in overall E-3 and E-4 manning. Sea manning levels in individual pay grade are sensitive to changes in the mix of 4YOs and 6YOs. If the EW rating maintains its current mix, then E-5 sea manning should rapidly decline to authorized levels and maintain that level after a brief dip below

authorizations. E-6 and E-7 sea manning is projected to be more variable than is the case for E-5s. Given the current mix of 6YOs and 4YOs, E-6 and E-7 sea manning levels are projected to surge significantly above authorized levels in the 1994 to 1995 time frame. At other times during the next ten years, E-6 and E-7 sea manning should be near authorizations. Sea manning for the E-8 and E-9 pay grades does not appear to be a problem.

If the share of 4YOs in the EW rating is increased, there would be significant changes to E-5 and E-6 sea manning. In brief, an increase in the number of 4YOs would cause a decline in E-5 sea manning and an increase in E-6 sea manning. This is because a typical 4YO serves an initial shore tour as an E-5 and returns to sea as an E-6, whereas a typical 6YO serves at least part of the initial shore tour as an E-6.

The outlook for promotion opportunities in the EW rating is fine. There should be a surge in promotions in the near future in order to attain full strength in the E-6 and E-7 grades. Subsequently, promotion opportunities should settle into a stable pattern, with a reasonable number of promotions each year. The only problem area remains the promotion opportunity for 4YOs from E-3 to E-4. The 6YOs will continue to supply more E-4 personnel than there are vacancies, leading to little, if any, opportunities for 4YO personnel to advance.

Finally, the individuals account in the EW rating should decline during the next couple of years. The current level of approximately 18 percent of personnel strength is very high and has been caused by the growth in the rating leading to large numbers of personnel undergoing training. If the mix of 6YOs and 4YOs is maintained at current levels, the individuals account is expected to drop tc approximately 10 percent of strength. In the event that the EW rating shifts to a completely 4YO rating, a further substantial decline in the individuals account is to be expected, with a 4YO EW rating requiring approximately 5 percent of its personnel in an individuals status.